

## CLAIMS

What is claimed is:

1. A short-time arc welding system operable to weld an element to a  
5 component, the system comprising:
  - a welding head device having a drive device operable to move the element in relation to the component;
  - a control and energy device, including a power supply device operable to supply an electrical power to the welding head device;
  - 10 a feed control device operable to control both an element feed and a movement of an individual element relative to the component; and
  - a safety switch operable to monitor a plurality of safety functions of the welding system;
  - wherein the safety switch defines a first operating state operable  
15 to enable at least one welding operation, and at least a second operating state.
2. The system of Claim 1, comprising:
  - one of a sensor device and a selection device which in the second  
operating state is operable to permit a selective activation of a plurality of  
20 individual components of the system;
  - wherein an output voltage of the power supply device is operatively blocked in the second operating state.
3. The system of Claim 2, wherein the selection device is operable to  
25 secure from the selective activation by an unauthorized person.

4. The system of Claim 1, wherein the first operating state corresponds to an ON mode having the at least one welding operation provided as one of a single welding operation and as a series of welding operations.

5 5. The system of Claim 4, wherein the second operating state corresponds to a STOP OPERATION mode, wherein at least the output voltage of the power supply device and an output voltage of the feed control device are operably blocked.

10 6. The welding system of Claim 5, comprising an operating mode selector securable from an unauthorised use and operably coupled to the safety switch wherein in the operating mode STOP OPERATION a selective activation of individual components of the system is enabled.

15 7. The welding system of Claim 4, comprising:  
an external operator control; and  
a welding operation activated in the ON mode wherein the welding head device is operably coupled to the external operator control.

20 8. The welding system of Claim 7, comprising:  
a third operating state corresponding to an operating mode AUTOMATIC;  
a fourth operating state corresponding to an operating mode MANUAL OPERATION, in which at least the output voltage of the power supply  
25 device is operably blocked; and  
a switching action of the operating mode selector wherein the operating mode selector operably switches between the operating mode AUTOMATIC, in which a welding operation is activated via the external operator control in the operating state ON, and the operating mode MANUAL  
30 OPERATION, in which at least the output voltage of the power supply device is operably blocked.

9. The welding system of Claim 7, comprising:  
a customer interface connected to the control and energy device;  
and

5 a bus operably coupling the external operator control to the  
customer interface.

10. The welding system of Claim 8, comprising:  
a manual operation defined by the operating mode MANUAL  
10 OPERATION; and  
a permission sensor which in the operating mode MANUAL  
OPERATION during a manual activation and simultaneous actuation of the  
external operator operably controls the manual operation to permit activation of  
selected functions of the welding system.

15 11. The system of Claim 10, comprising a feed unit operable to feed  
the element to the welding head device for welding.

20 12. The welding system of Claim 11, comprising:  
a drive of the welding head device operable to one of raise and  
lower the element;  
wherein the permission sensor in the operating mode MANUAL  
OPERATION operably permits a feeding of the element via the feed unit and  
activation of the drive.

25 13. The welding system of Claim 1, comprising:  
a constant-current source within the power supply device;  
an output voltage of the constant-current source; and  
a pulse blocker switch operable to block the output voltage of  
30 the constant current source.

14. The welding system of Claim 1, wherein the control and energy device comprises:

a control device operable to control the welding system; and  
an input device operable to input a plurality of operating

5 commands.

15. The welding system of Claim 14, comprising:

a fifth operating state corresponding to an operating mode  
OPERATOR'S SAFETY of the safety switch;

10 wherein on activation of the operating mode OPERATOR'S  
SAFETY the power supply device and the feed control device are operably  
delayed and disconnected from the electrical power in a defined manner, while  
the control device and the input device remain on a protective low voltage and  
the customer interface is operatively supplied with a voltage; and

15 wherein a manual cancellation of the operating mode  
OPERATOR'S SAFETY operably leads to a resumption of the operating mode  
ON following a time delay.

16. The welding system of Claim 4, comprising:

20 a protective low voltage operatively provided to the control device  
and the input device;

wherein in the operating mode STOP OPERATION the output  
voltage of the power supply device is operably blocked and the output voltage of  
the feed control device is sequentially delayed and disconnected from the  
25 electrical power, the control device and the input device operably remaining on  
the protective low voltage and the customer interface operatively supplied with a  
voltage; and

wherein a manual cancellation of the operating mode STOP  
OPERATION immediately leads to a resumption of the operating mode ON.

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17. The welding system of Claim 15, comprising:  
an external control system operatively connected to the control and  
energy device;  
an external operator control of the external control system; and  
5 a plurality of connections of the safety switch;  
wherein the plurality of connections of the safety switch operatively  
couple the safety switch to the external operator control.

18. The welding system of Claim 17, wherein the connections  
10 operatively meet a safe technology design for both transmission and monitoring  
of at least a command for each of the operating mode STOP OPERATION and  
the operating mode OPERATOR'S SAFETY.

19. The welding system of Claim 1, wherein the safety switch operably  
15 meets a safe technology design.

20. A short-time arc welding system operable to weld an element to a component, the system comprising:

a welding head device having a drive device operable to move the element in relation to the component;

5 a control and energy device, including a power supply device operable to supply an electrical power to the welding head device;

a feed control device operable to control both an element feed and a movement of an individual element relative to the component;

a control device operable to control the welding system; and

10 a safety switch operable to monitor a plurality of safety functions of the welding system;

wherein the safety switch defines a first operating state operable to enable at least one welding operation, a second operating state having an output voltage of the power supply device operatively blocked, and a third  
15 operating state.

21. The system of Claim 20, comprising:

a selection device operable in the second operating state to enable a selective activation of a plurality of individual components of the system;

20 wherein the selection device is operable to secure from the selective activation by an unauthorized person.

22. The system of Claim 20, comprising an input device operable to input a plurality of operating commands.

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23. The system of Claim 20, comprising a feed unit operable to feed the element to the welding head device.

24. The welding system of Claim 20, comprising:  
an external control system operatively connected to the control and  
energy device;

5 an external operator control of the external control system; and  
a plurality of connections of the safety switch;  
wherein the plurality of connections of the safety switch operatively  
couple the safety switch to the external operator control.

10 25. The welding system of Claim 24, comprising:  
the third operating state defining a manual welding operation; and  
a permission sensor simultaneously operable with the external  
operator control to operably control the manual welding operation.

26. A method to control a short-time arc welding system operable to weld an element to a component using electrical power from a control and energy device connected to a drive device, in turn coupled to a welding head, the method comprising:

5 moving the element in relation to the component using the drive device;

supplying an electrical power to the welding head device from a power supply device of the control and energy device;

10 controlling both an element feed and a movement of an individual element relative to the component using a feed control device; and

monitoring a plurality of safety functions of the welding system using a safety switch; and

15 initiating a first operating state operable to enable at least one welding operation and at least one second operating state using the safety switch.

27. The method of Claim 26, comprising

20 selectively activating a plurality of individual components of the system using one of a sensor device and a selection device in the second operating state; and

blocking an output voltage of the power supply device in the second operating state by one of the sensor device and the selection device.

25 28. The method of Claim 26, comprising enabling the at least one welding operation as one of a single welding operation and as a series of welding operations in the first operating state, corresponding to an ON mode.



29. The method of Claim 26, comprising blocking at least the output voltage of the power supply device and an output voltage of the feed control device in the second operating state corresponding to a STOP OPERATION mode.

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30. The method of Claim 29, comprising:  
coupling an operating mode selector securable from an unauthorised use to the safety switch;  
enabling a selective activation of individual components of the system in the operating mode STOP OPERATION using the safety switch; and  
blocking at least the output voltage of the power supply device and the output voltage of the feed control device in the operating mode STOP OPERATION.

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31. The method of Claim 26, comprising  
enabling a third operating state corresponding to an operating mode AUTOMATIC; and  
blocking at least the output voltage of the power supply device in a fourth operating state corresponding to an operating mode MANUAL OPERATION.

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32. The method of Claim 31, comprising:  
activating a welding operation via an external operator control in the ON mode;  
blocking at least the output voltage of the power supply device; and  
switching between the operating mode AUTOMATIC and the operating mode MANUAL OPERATION using a switching action of an operating mode selector.

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33. A method for controlling a system to weld a short-time arc welding element, including a metal stud, onto a component, including a metal sheet, using a welding head device operatively moved in relation to the component along an arc, the method comprising:

- 5                    monitoring the system for a stop command;  
                     determining if the stop command is a STOP OPERATION  
command, operable to partially shut down the system; and  
                     performing the following steps, if the stop command is the STOP  
OPERATION command:
- 10                    delaying both a power supply device for the welding  
head device and a feed control device operable to control a feeding of the  
element;
- controlling a movement of the element relative to the  
component; and
- 15                    at least subsequently blocking an output voltage of both the  
power supply device and the feed control device.

34. The method of Claim 33, comprising monitoring if a switch  
securable from an unauthorised actuation emits a switching signal for an  
20 operating mode MANUAL OPERATION.

35. The method of Claim 34, comprising monitoring if a permission  
sensor emits a sampling signal.

25                    36. The method of Claim 35, comprising:  
                     enabling a plurality of predetermined functions of the welding  
system; and  
                     simultaneously blocking the output voltage of the power supply  
device if both the switching signal for the operating mode MANUAL OPERATION  
30 is received and the sampling signal of the permission sensor are received.

37. A process for controlling a system to weld a short-time arc welding element, including a metal stud, onto a component, including a metal sheet, wherein the element is welded to the component by a welding head device being moved in relation to the component along an arc, the method comprising:

- 5 monitoring the system for a stop command;
  - determining if the stop command is a STOP OPERATION command, operable to partially shut down the system;
  - if the stop command is the STOP OPERATION command:
    - delaying both a power supply device for the welding
    - 10 head device and a feed control device operable to control a feeding of the element;
    - controlling a movement of the element relative to the component; and
    - blocking at least an output voltage of both the power supply
    - 15 device and the feed control device;
    - monitoring if a switch securable from an unauthorised actuation emits a switching signal for an operating mode MANUAL OPERATION;
    - identifying if a permission sensor emits a sampling signal;
    - simultaneously blocking the output voltage of the power supply
    - 20 device if both the switching signal for the operating mode MANUAL OPERATION is received and the sampling signal of the permission sensor is received.

38. The process of Claim 37, comprising enabling a plurality of predetermined functions of the welding system.